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ABSTRACT

This comparison of students' learning from reading books and from watching television uses Gavriel Salomon's model of learning effects, which is based on the amount of mental effort invested (AIME) in a medium as determining how deeply the information from that medium is processed. Mental effort, in turn, is predicted to depend on two perceptions with respect to the medium: perceived demand characteristics, and perceived self-efficacy. The subjects were 140 Dutch eighth graders whose test results were compared with those of a study done in the United States. The data showed that Dutch children, like American children, invest more mental effort in reading books than in watching television, and have lower perceived demand characteristics for television than for books. In contrast to American children, Dutch children did not perceive themselves to be more efficacious in learning from television. When measuring mental effort and perceived self-efficacy, the data for the Dutch children produced nonsignificant (negative) correlations for both media, while the data for American children correlated positively for books and negatively for television, which they regarded as the "easy medium." The results from both studies are also compared to a similar study undertaken in Israel. The text is supplemented with three tables, four figures, and a 10-item bibliography. (EW)

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MENTAL EFFORT AND PERCEPTIONS OF TV AND BOOKS: A DUTCH REPLICATION STUDY BASED ON SALOMON'S MODEL OF LEARNING

Paper presented at the Second European Conference for Research on Learning and Instruction (EARLI), Tübingen F.R. of Germany, September 19-22, 1987

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1 Introduction

The learning effects of television are mostly discussed in comparison to what can be learnt from books. In that comparison television is often claimed to be a superficial medium: although we may learn things from television, it is all information which can be acquired without much analysis or reflection. Usually, this claimed superficiality is explained by pointing at its characteristics, for instance the high speed of presentation, the frequent interruptions, the swiftly changing camera angles and the overwhelming sound effects (Singer & Singer, 1983). Television is said to bombard viewers with an overdose of stimuli, inhibiting further elaboration of the information. Some critics go even further. One of them is Neil Postman (1983), who argues that the dynamic television images have nothing to say at all but only serve to attract and hold attention. Books are about something, they are "content oriented" as Postman puts it, but television is "form oriented" and the contents are lost in a sea of pretty, moving pictures. The implication would be that children don't learn much in all those hours of watching TV, even though there are programs from which they could learn.

Pleads for the superficiality of television emphasize the influence of medium characteristics on viewers. The role that viewers may play in the intake of information is underrated. As recent studies show, children do more than just stare at television (Collins, 1982). They actively screen television images for understandability and attractiveness. Children watching Sesame Street, for instance, hardly paid any attention to parts of the program they could not understand (Lorch, Anderson & Levin, 1979). The general observation is that viewers do not only passively take in, but also actively select and even change what television shows, in accordance with their own prior knowledge, attitudes and beliefs.

2 Salomon's model

This observation is reflected in the theoretical model which is the subject of this paper. The model was proposed by Gavriel Salomon (1981, 1984). It is about learning from media, and has been specifically applied to television and books. Figure 1 schematically shows the main parts.

- Figure 1 to appear about here -

The central concept in the model is the amount of invested mental effort. The concept refers to how hard one tries to actively process presented information. The amount of mental effort invested in a medium determines how deeply information from that medium is processed. Some learning effects, such as remembering names or other simple factual information, do not need much mental effort. Other kinds of learning, however, are dependent on the amount of mental effort. An example is "inferential learning", which supposes that learners go beyond the information given, by making inferences. Such learning effects depend on the amount of mental effort invested in a medium.

Mental effort, in its turn, is predicted to depend on perceptions with respect to a medium. In the model two of these perceptions are specified. The first is labelled "perceived demand characteristics", which refers to the degree a medium is perceived to pose demands. The perceived demand characteristics of a medium will be high if the medium usually presents complex instead of simple information, or if a medium is often used for learning instead of amusement. The second kind of perception that affects the amount of mental effort is one's "perceived self-efficacy", a concept originally proposed by Bandura (1982). One's perceived self-efficacy towards a medium is high, if one perceives oneself to be quite capable of obtaining information from that medium.

The amount of mental effort that is invested in a medium is determined by the interaction of the two kinds of perceptions. This interaction is pictured in figure 2.

- Figure 2 to appear about here -

In this figure the relationship between the amount of invested mental effort (or AIME) and perceived self-efficacy (or PSE) is shown for two media which differ in their perceived demand characteristics (abbreviated as PDC). Suppose a medium is perceived as posing high demands: the relationship for such a medium is suggested in the line which, starting from the left, is going up; people who regard a medium as difficult will not invest much mental effort in it, unless they see themselves as quite

capable of obtaining information from that medium. For a medium that is perceived as posing low demands, the relationship is caught in the line going down from left to right: people who see a medium as easy will only invest mental effort if they doubt their own mastery of that medium.

Now about television and books. It is predicted that most children perceive television as an easy medium: it poses low demands and children perceive themselves as highly able to learn from it. Consequently children invest little mental effort in television.

Books on the other hand are seen as tough: they pose high demands and children's perceived self-efficacy associated with books is lower than for television. As a result, the amount of invested mental effort is relatively high.

With the model the issue of superficiality is drawn into a different perspective: how much children learn would not only depend on medium characteristics, but on the mental effort viewers are willing to invest.

3 Research questions

The model was previously tested in two studies in Israel (Salomon & Leigh, 1984) and one in the USA (Salomon, 1984). We undertook a replication study with a twofold purpose. First we wanted to determine the quality of the measurement instruments in a Dutch setting. Second we wanted to test some hypotheses following from the model and compare the results with previous findings:

1. Children invest more mental effort in books than in television, or the amount of mental effort invested in books is greater than the amount of mental effort invested in television.
2. Books are perceived to pose higher demands than television, so the perceived demand characteristics of books are greater than the perceived demand characteristics of TV.
3. Children think they are more able to learn from television than from books, so the perceived self-efficacy for TV is greater than the perceived self-efficacy for books.
4. For television, the perceived self-efficacy is negatively correlated to mental effort, whereas for books the two variables show a positive correlation.

4 Method

4.1 Subjects

Subjects were 140 eighth-graders, who are around 11 years of age. This group was chosen so that we could compare our results to the Israeli and American studies carried out by Salomon and his associates.

4.2 Instruments

Instruments were translated from the English originals kindly provided by professor Salomon.

AIME. The AIME-instrument consists of 9 questions per medium. Subjects are asked to indicate on 4-point scales how hard they usually try to understand 9 types of books and 9 comparable types of TV programs (Salomon & Leigh, 1984). Although Salomon & Leigh intent to measure the actually invested mental effort, in fact the instrument assesses the mental effort as estimated by children themselves. An important question is if these self-reports make a valid measure of the actual mental effort. This question is even more important since other methods to measure mental effort, such as reaction time measures, are not feasible in survey-studies. Salomon & Leigh trust self-reports about mental effort for two reasons. First, mental effort is an intentional, non-automatic process which theoretically seems accessible for retrospection. Second, in the research done so far, the instruments have produced results that match the theoretical predictions. For these reasons it seems justified to use the original AIME-instrument in a first replication study. So, in this study we assume, as Salomon did, that the answers on the AIME-instrument form a good indication for the mental effort actually invested.

PSE. The PSE-instrument consists of 10 items per medium. Subjects indicate on 4-point scales how easy it would be for them to learn 10 topics from books and from TV (Salomon, 1984).

PDC. The PDC of television and books were measured in two ways. In the first measure subjects are asked to indicate on 5-point scales how lifelike TV and books are and how important it is who the producer or author is (realism scale). Salomon assumes that material that is perceived

as more lifelike or less affected by the role of the author is less demanding in the eyes of the reader or viewer.

The second measure includes two four-choice attribution questions for each medium in which subjects are asked why a child does or does not completely understand a TV program or book. The causes the subjects can choose from are either internal or external. If the comprehension of a TV program is attributed to internal causes (the child is smart/trying hard), TV is perceived as demanding. If children, on the other hand, refer to external causes (TV programs are easy), they see TV as undemanding. The reverse goes for the second attribution question (Salomon, 1984).

4.3 Procedure

The instruments were group administered by the author in the fall of 1986.

5 Results

5.1 Internal consistency.

The internal consistency of both TV and book measures of AIME and PSE was acceptable: Cronbach's alphas varied from .71 to .88.

Contrary to Salomon's (1984) finding, the internal consistency of the realism scale was not acceptable: alphas for books and TV were .23 and .29.

The attribution measure of PDC also lacked internal consistency. Although both internal attribution to explain why a book or program is understood well and external attribution to explain a lack of understanding were assumed to indicate high PDC, they correlated negatively.

5.2 Internal structure.

Principal components analyses on the AIME and PSE instruments seperately, both revealed a common first factor explaining 39% and 21dren to dev which information can quite easily be obtained.

Interestingly, related cultural differences were previously found by Salamon & Cohen (1978), some ten years ago . They found that Israeli

only measure children's perception of media, but also their perception of genres.

A principal components analysis revealed that the lifelikeness items of the realism scale did not measure the same concept as the items on the importance of the author or producer. On the first principal component the former items showed positive loadings whereas the latter loaded negatively. This explains the instrument's low internal consistency mentioned earlier.

5.3 The model's predictions

The first hypothesis was that children invest more mental effort in books than in television. As shown in Table 1, this was previously found in Israel and we found a similar difference, at least on the whole.

Table 1 Means and t-values of mental effort for books and television in the Israeli study (1) and the Dutch replication study (2)

Studies	Books	TV	t
(1) Salomon & Leigh (1984)	2.78	2.42	2.87*
(2) Replication (1986)	2.65	2.51	3.78*

*p<.01

As can be seen in Figure 3, however, for some types of books and TV-programs, the differences in reported mental effort were minimal or even nonexistent.

- Figure 3 to appear about here -

This suggests that the amount of mental effort invested in books is not always greater than the effort invested in television. Instead it seems to depend on the genre involved.

The second hypothesis predicted that the perceived demand characteristics of television are lower than those of books. As described before, unlike Salomon (1984) we could not form a homogeneous realism

scale because the items about the lifelikeness of books and television appeared to measure a different concept than the items about the importance of the author or producer. Salomon (1984) only reports about the realism sale as a whole and not about the individual items. Therefore, Salomon's study and our replication study are not compared on this point. Still, our subjects respond on most questions as expected by Salomon: television is perceived as more lifelike than books and children find it less important to know the producer of a television program than the writer of a book.

The attribution measure of the PDC of both media resulted in conflicting results. On the question why a child understands a program or book quite well the answers match Salomon's theory. Comprehension of a television program is attributed to internal causes by a greater percentage of the children than the comprehension of a book: 49% and 91% respectively. According to this question books are seen as more difficult than television. But the reverse question, in which the lacking comprehension of a fictitious child is to be explained, shows the opposite. More subjects choose external causes, indicating high PDC, for television than for books: 56% and 38% respectively. So according to this question books would be easier than television programs. We will return to this question in the discussion.

The third hypothesis was not confirmed. Contrary to the prediction and the results of a study in the USA, our subjects did not perceive themselves to be more capable of learning from television (see Table 2).

Table 2 Means and t-values of perceived self-efficacy for books and television in the USA study (1) and in the Dutch replication study (2)

Studies	Books	TV	t
(1) Salomon (1984)	2.91	3.84	?*
(2) Replication (1986)	2.75	2.73	-.43

*p<.01 (t-value not reported)

Figure 4 suggests that the perceived self-efficacy depends on the interaction of the medium and the topics that are mentioned in the question. According to the subjects, the five topics in the lower part of the figure are easier learnt from books, while the five topics in the upper part of the figure are easier learnt from television.

The last hypothesis was not confirmed either. We did not find the correlations between mental effort and perceived self-efficacy as predicted by the model and previously found in the USA (see Table 3).

Table 3 Pearson correlations between perceived self-efficacy and mental effort for books and television in the USA study (1) and the Dutch replication study (2)

Studies	Books	TV
(1) Salomon (1984)	.37*	-.49
(2) Replication (1986)	-.13	-.01

*p<.01

This finding may follow from the fact that in our study the PSE for television was not always higher than for books. To check this possible explanation, new PSE scales were formed using only those items on which the PSE score for television was higher than for books. However, these PSE scales did not correlate with mental effort either, nor for television (r=.03) nor for books (r=-.08).

6 Discussion

6.1 The instruments

Only the instruments for mental effort and perceived self-efficacy show an acceptable degree of internal consistency. Principal components analyses on these instruments show one general factor and several specific factors which are related to specific kinds of programs and books. This suggests that the invested mental effort and the perceived

self-efficacy not only depend on the medium, but are also determined by the type of televison program or book involved.

Both measures of the perveived demand characteristics of books and television appear to lack internal consistency. In the realism scale this is caused by the fact that the items about lifelikeness measure a different concept than the items about the importance assigned to the author or producer. This reason in itself suffices to disqualify the realism scale as a measure of PDC. Besides Salomon's assumption, that a medium product is experienced as easier when it is seen as more realistic, may be questioned. It is known for instance, that the age group studied finds detective films much more realistic than cartoons (Van der Voort, 1986). Following Salomon's assumption this would mean that children find cartoons to be more difficult than detective films, and this seems very unlikely indeed. Therefore, we doubt very much if the reality perception of television programs and books can be taken to indicate the perceived demand characteristics.

The two types of attribution questions produced conflicting results. The first question (why a program or book is understood quite well) confirms the expectation that books are perceived to be more difficult than television, but the second question (why a program or book is not understood) elicits answers that oppose Salomon's expectation. In Salomon's (1984) USA study responses on both questions matched the theory, albeit more convincing on the first question.

We do not understand this difference between Salomon's and our own results. We can explain, however, why the second question in our study shows an unexpected response pattern. In our opinion, all alternative explanations offered for the failure to understand a program or book can be interpreted as indicating high PDC. If subjects choose the explanation that the book or program must be difficult, this of course indicates high PDC. But the choices 'the child is not smart' or 'did not try hard' can be taken to indicate high PDC as well, for in these choices one implicitly says that a certain degree of intelligence or effort is required to understand a program or book. Only if these alternatives are formulated more extremely ('the child is really stupid' or 'the child was sleeping with its eyes open') they unambiguously indicate low PDC.

6.2 The model's predictions

Our replication study confirms the hypothesis that children invest more mental effort in reading books than in watching television. This is true on the whole, because for some books and programs the difference in mental effort is minimal or even nonexistent. This suggests that television does not always elicit more mental effort than books.

As previously discussed, the validity of the AIME-instrument is a point of concern. Although self-reports about an intentional process like investing mental effort seems possible in theory, validation studies in which mental effort is assessed along different paths are called for.

The second hypothesis stating that the perceived demand characteristics for television are lower than for books, is confirmed. Hereby we refer to the attribution question which asks to explain why a program or book is understood quite well (for neither the other attribution question nor the realism scale make valid PDC-measures).

Contrary to the prediction subjects did not perceive themselves to be more efficacious in learning from TV. Instead, PSE appeared to depend on the interaction of medium and topic: some topics are easier learnt from TV but other topics from books. Apparently, for Dutch children, not all topics are easier learnt from television than from books. In this respect they differ from their North-American peers, who do find all topics easier to learn from television. There may be cultural differences involved here, between the USA and the Netherlands, caused by differences in television experience. During childhood, Dutch children are confronted with foreign programs of which they understand little before they can read the subtitles. For American children, on the other hand, most programs are in the language they know. That does not mean that they actually understand everything, but they can easily think they understand everything. In addition, most TV-programs in the USA are regularly interrupted for commercials which are often understandable for children. In sum, North-American children have more opportunities than Dutch children to develop the perception that television is a medium of which information can quite easily be obtained.

Interestingly, related cultural differences were previously found by Salamon & Cohen (1978), some ten years ago . They found that Israeli children outperformed their North-American peers in answering simple

questions about programs they had watched the previous day. Salomon & Cohen noted that Israeli children watched television more seriously. They suggested that the effortless style of television viewing prominent among children in the USA may be facilitated by the frequent shifting from channel to channel and the interruptions caused by commercials. These findings are in line with ours.

The last hypothesis was that mental effort and perceived self-efficacy would correlate positively when books are involved and negatively when the 'easy medium' television is concerned. Indeed Salomon (1984) found these correlations with North-American subjects. With our Dutch subjects, however, we found non-significant (negative) correlations. There may be several reasons why we could not replicate the USA findings on this point. First, the assessment of mental effort was not identical in both studies. Like in the Israeli studies, the AIME-instrument in our study consisted of questions about the mental effort one usually invests in various kinds of television programs and books. In the USA study the questions were about a specific story that was just seen or read. It is possible that these two designs yield different results, although in the Israeli studies the instruments appeared to correlate positively with each other. A second reason may be that the answers about mental effort and self-efficacy of our subjects seem to depend on the topics mentioned. However, the nine topics mentioned in the questions about mental effort differed from the ten topics in the questions about self-efficacy. And when children differentiate between different kinds of books and TV-programs, one cannot expect two instruments to correlate unless they are about the same topics.

7 Implications

Our replication study has several important implications for the instruments used. First, improved instruments should be developed to measure the perceived demand characteristics. Furthermore it is necessary to validate the instruments for mental effort and perceived self-efficacy, although reasonably reliable in themselves.

The most interesting implication, however, follows from the differences found between Dutch and North-American children. For future developments of instruments and theory it is important to note that Dutch children, unlike their USA peers, do not unconditionally regard televison as the easier medium. According to Salomon's model, it is therefore unlikely that Dutch children process all information from television in a shallow way. Television does not seem to be inherently superficial, due to some of its characteristics. In fact, we are led to the somewhat paradoxical conclusion that television may be a less superficial medium in the Netherlands and Israel than in the USA.

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Figure 1 Schematic presentation of the main parts of Salomon's model

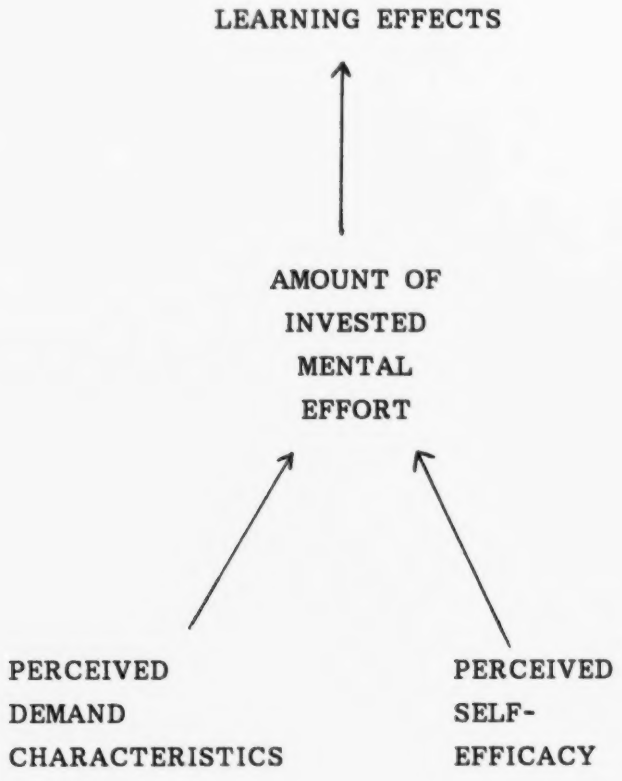


Figure 2 Hypothetical relations between mental effort, perceived self-efficacy and perceived demand charactertistics according to Salomon's model

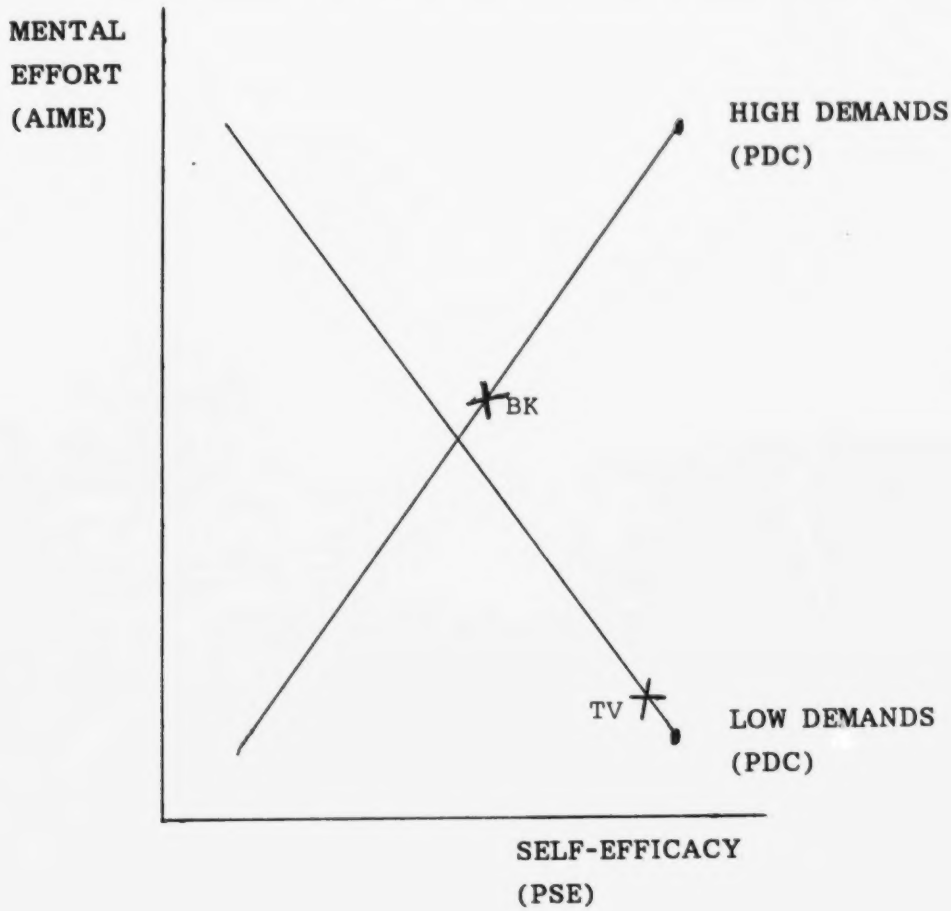
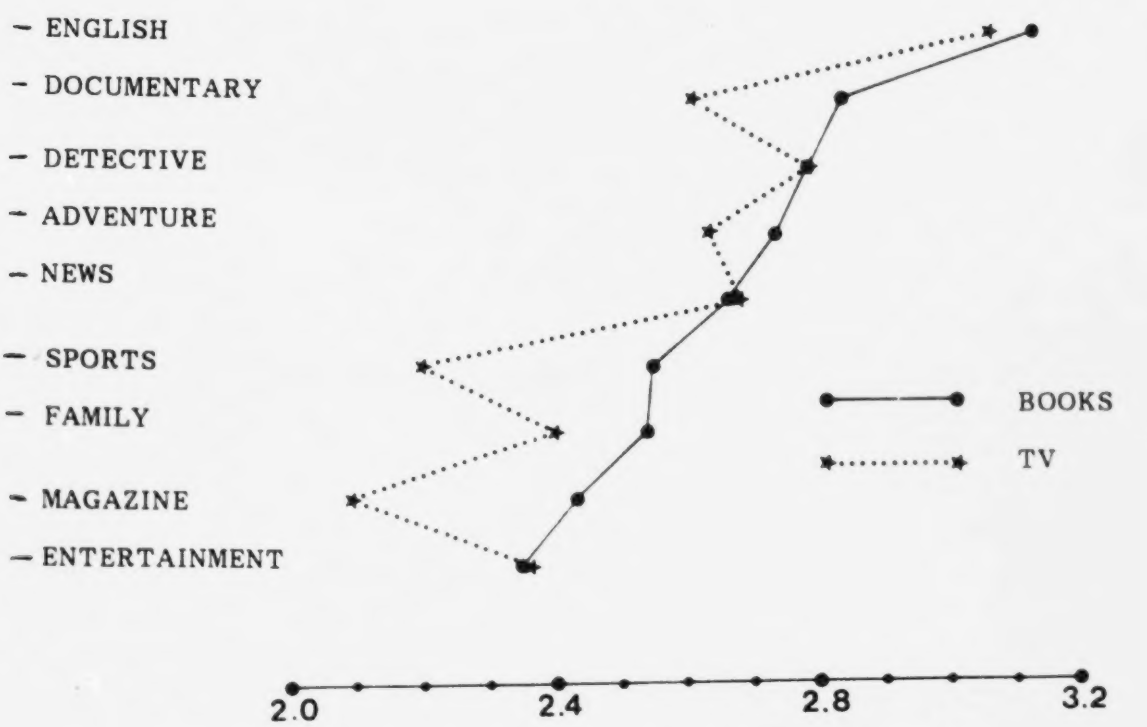


Figure 3 Menas of mental effort per topic for books and television



(1 = NO MENTAL EFFORT; 4 = MAXIMAL MENTAL EFFORT)

Figure 4 Means of perceived self-efficacy per topic for books and television